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SOME MILD-MATH APPLICATIONS IN THE LIVESTOCK-MEAT INDUSTRY

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Participants in the livestock-meat industry deal with perishable products that are bought and sold daily. The industry is intensely price-competitive. Each day these participants are concerned about determining a proper price for the products they sell, and about the costs of the products they buy. They know their own operating costs and the price mark-ups needed to cover these operating margins or, given those selling prices, the necessary price maximums (after subtracting margins from sales) they can pay for the products they buy. They seem constantly engaged in working their way through some mild-math predicament.

Meatpackers deal in prices and values for meat — carcasses and cuts — which are quoted daily by both public and private reporting services. (The National Provisioner 'Yellow Sheet' is a popular and widely-used example.) But livestock markets and producers are accustomed to prices and values quoted daily in liveweights. So livestock purchase transactions involve a necessary price translation from wholesale meat price to live prices. These transactions also involve buyer estimates of carcass characteristics of live animals, characteristics that can only be identified precisely after slaughter. Finally, some bargaining between buyers and sellers customarily accompanies the search for a transaction price. All these circumstances, e.g., margin maintenance, live/carcass/live price translations, performance judgments, even bargaining ploys are included in the accompanying illustrations. A hedging illustration is also included.

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*This information set is one of a series used as teaching aids in AEC 522, Economics of the Livestock-Meat Industry, a course in the College of Agriculture at The Ohio State University. Single copies may be obtained by requesting ESO-2120, Department of Agricultural Economics, The Ohio State University, Columbus 43210.

1. Concentration Yards Sort Hogs

You probably know that grain elevators do three things to the grain they buy from local producers: they dry it, clean it, and blend it. Blending means they mix grain (say corn) from different sellers on different days until the blend just meets the requirements for a certain grade, say US No. 2 Yellow, a popular grade in the grain trade.

Concentration yards do this same thing with hogs. They sort (blend) their daily purchases into very uniform lots because their packer customers want their hogs to fit into very narrow ranges of desirable specifications. These markets are also motivated by the fact that different weight ranges command different prices in the slaughter hog trade. Maybe today's hogs weighing 231-250 are at a $3 premium over hogs in the 251-270 range, and at a $2 premium over hogs weighing 210-230. The market operator will sort hogs to maximize the number of lots that average in the premium weight range. Some days it just won't work out. But the operator has a practiced eye and his job requires taking advantage of his opportunities. When sorting is profitable, he is not likely to miss his chance. So, it might pay you to plan your sale before you leave home, decide whether maybe you should do a little sorting of your own. Here's an illustration:

You take 30 hogs to your local hog market, knowing as you do so that four of them are a little heavy (but maybe they won't notice at the yards). So you sell them as a lot. They weigh 7560 pounds, averaging 252. That's just out of the premium range, but you still get $53/cwt. and you go home with a check for $4,006.80.

But the buyer did notice. Almost before the hogs were off the truck, he was sure he had seen 3 or 4 hogbacks just a tad taller than the rest. So after you've gone back home, he sorts out 4 hogs. They weigh 1068 pounds (average 267). These, he had paid the right price for. But the other 26 hogs now weigh 7560 - 1068, or 6492 (average 249.7). These are in the premium weight range and he paid $3 too little for them. But he will make sure to sell them for the right price, which is $56/cwt. That $3/cwt. premium (x 26 x 249.7) is worth $194.77 to the market..... and you're the seller who gave the money away.

2. Fixed Versus Variable Costs

A packer buys cattle for his killing floor through order buyers, paying $5 per head and freight (he is small and likes this variable cost way of buying because it is directly proportional to his kill and it stops completely when he shuts down). But his operation has been growing and he begins to think a fixed cost way of buying might be cheaper (because fixed costs can be very good for you if you grow but eat you alive if you slow down). So he considers hiring a packer buyer for a salary of $30,000 and providing him a company car and benefits package that will cost another $30,000. Now the thing he needs to figure out is the breakeven monthly kill: above that level he is better off with the salaried employee and below that he is better off with order buyers. You tell him his breakeven monthly kill is: (a) 500; (b) 1000; (c) 5000; (d) 12000.

3. Converting carcass weight price to liveweight and vice-versa

Packers deal with wholesalers and retailers on the basis of meat prices that are published daily in some publication like the National Provisioner Yellow Sheet. When packer buyers are instructed on prices to pay, the instructions are in carcass prices. It is the buyers' job to make the last-minute conversion to the live prices that are customary among producers and livestock markets. He makes this conversion in his estimate of dressing percentage — i.e., his estimate of the weight of the carcass as a percentage of live weight.

To make the math easy, we could use examples based on a 60% dress for fed steers and 70% for finished hogs although each of these is somewhat lower than the real-life average.

If a buyer has been instructed to buy cattle for 'a dollar' (or under), he is expected to pay not more than $1.00 per pound carcass. When he looks at live cattle that weigh 1,000 pounds and estimates they will dress 60%, he is supposing the carcass will weigh 600 pounds and be worth $600. Since there are 10 hundredweight in the live animal he is thinking in terms of a price of $60 per hundredweight.

All this boils down to $1.00 x 60% = 60¢ per pound, or $60 per cwt.

And carcass hogs at 70¢ dress = 49¢ per pound, or $49 per cwt. alive.

If live cattle are $72 then carcass price is $120 (72 ÷ 60% = $120 per cwt or $1.20 per lb.)

4. Figuring Pencil Shrink

Shrinkage is the normal weight loss that occurs to livestock in the marketing process because they are off feed and water, probably for the first time in their lives, and they are stressed by the marketing environment.

Being normal, buyers know it will happen. The livestock that arrives at the packing plant will weigh less than their weight when the purchase agreement was made. So buyers often try to extimate what the weight loss will be and figure this into their offer. This estimate is called pencil shrink, and you can see that this is a legitimate concern for the buyer to have. (In an auction, where he can't negotiate a pencil shrink, he may just figure the dressing percent at 60 even though he knows it will actually be more like 62.)

But there are other reasons for trying to figure pencil shrink: (1) There may be no scales at the feedlot and the buyer is estimating their weight at the plant; (2) it may be used as a substitute for an overnight stand (off feed and water); (3) it can be used to elevate an apparent price to compete with prices being quoted at nearby markets; and (4) it is a bargaining device that helps the buyer stay ahead of the seller. For whatever the reasons, if a buyer offers ($72 and 3% shrink" it means he will pay $72 for 97% of the actual weight:

> $72 and 3% = $72 x .97 = $69.84 for 100% of the weight
>
> But if you want $72 and no shrink you counter a 3% shrink offer with a price of $74.23 and 3% ($72 ÷ .97 = 74.23 - or - $74.23 x .97 = $72).

3. Figuring Net Price

You have alternative market outlets. Some have marketing charges and others don't. They are located at various distances from your operation. They have different price quotes in the media or on the phone. When you consider these markets you need to figure what your net return would be at each market by taking into account (a) marketing charges; (b) shrinkage loss; and (c) freight costs (even if you do your own hauling). Here you are comparing price quotes and costs for a truckload of 40 fed steers which will weigh about 40,000 pounds. Do you agree with the figures in this example?

Marketing Costs	Terminal (100 mi.)		Auction (20 mi.)		Dealer Market (10 mil)		Packer (40 mi.)	
	Quoted	Per Cwt	Quoted	Per Cwt	Quoted	Per Cwt	Quoted -4% 3/	Per Cwt
Gross Price	64.00	64.00	63.00	63.00	61.50	61.50	62.50	60.00
Commission	160.00	.40	180.	.45	--	--	--	--
Yardage	$60.00	.15	$40.00	.10	--	--	--	--
Feed	$40.00	.10	--	--	--	--	--	--
Shrinkage[1]	3½	2.10	2½%	1.50	1½%	.90	3%[4]	1.80?
Transportation[2]	40+200 =$240	.60	40+40 =$80	.20	40+20 =$60	.15	[5]	--
Net Price	$60.65		$60.75		$60.45		$60.00	

[1] Estimate value of shrink at 60¢ per pound.

[2] Freight costs $1.00 per head loading plus $2.00 per loaded mile.

[3] At your feedlot. Packer's freight. You pay no direct marketing costs.

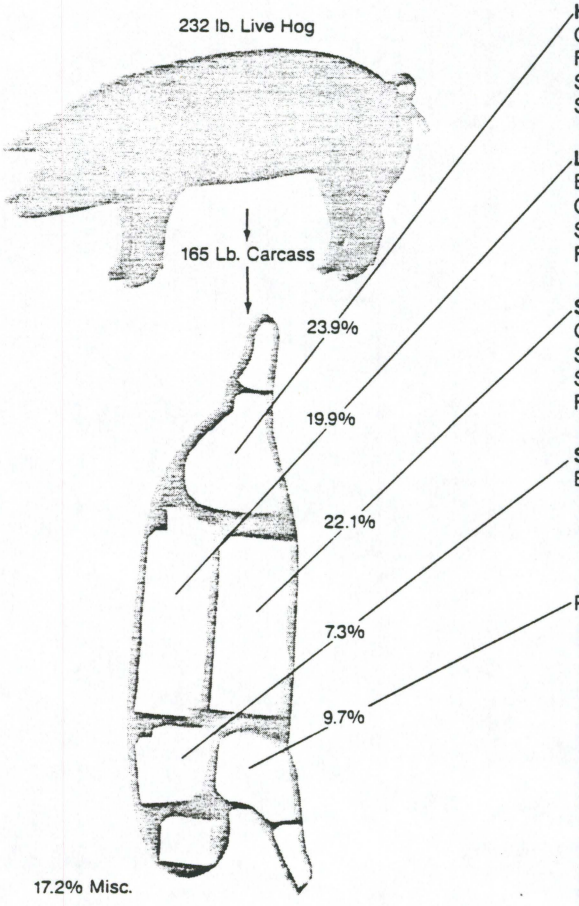
[4] Over the packer's scales. Must you now deduct actual or pencil shrink from this weight?

[5] Freight paid by packer is $2.00 per loaded mile with no loading charge. (Is this relevant?)

4. Carcass Cutout Tests

Every merchant dealer needs to know the kind of information contained in this illustration. It is the basis for his determination of price mark-ups that will average out to the proper operating margin to cover his costs. An example of the decisionmaking he goes through is presented on a following page in an examination format.

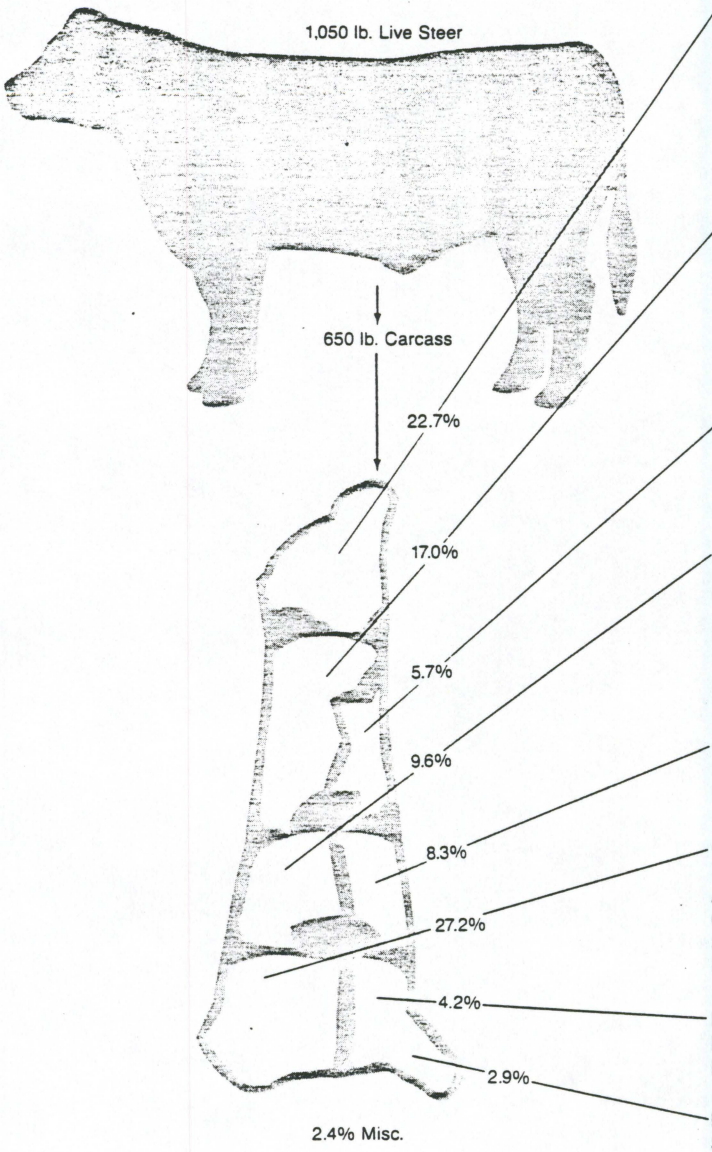
Hog Carcass Breakdown



	Retail Pork* (Lbs)	Other Products (Lbs)	Carcass Total (Lbs)
HAM (39.4 lbs)			
Cured ham	20.1		
Fresh ham	4.1		
Sausage Trimmings	3.0		
Skin, fat, bone		12.2	
Total	27.2	12.2	39.4
LOIN (32.9 lbs)			
Blade roast	8.0		
Center Chops	17.3		
Sirloin roast	5.6		
Fat		2.0	
Total	30.9	2.0	32.9
SIDE (36.4 lbs)			
Cured bacon	18.6		
Spareribs	6.4		
Sausage Trimmings	9.4		
Fat		2.0	
Total	34.4	2.0	36.4
SHOULDER (28.0 lbs)			
Blade (Boston) Butt			
Blade steaks	7.0		
Blade roast	4.2		
Trimmings	0.8		
Total	12.0		12.0
Picnic			
Arm roast	7.7		
Trimmings	3.7		
Skin, fat, bone		4.6	
Total	11.4	4.6	16.0
MISCELLANEOUS (28.3 lbs)			
Jowls, feet, tails, Neckbones, etc.	6.5		
Trimmings	3.9		
Fat, skin, bone		14.4	
Shrink and loss		3.5	
Total	126.3	38.7	165.0

Source: American Meat Institute Meatfacts, 1984; derived from USDA and industry figures.

Steer Carcass Breakdown



	Retail Beef (Lbs)	Other Products (Lbs)	Carcass Total (Lbs)
ROUND (147.6 lbs)			
Top (inside) round	22.5		
Bottom (gooseneck) round	21.7		
Tip	14.0		
Rump	5.1		
Stewing beef, ground beef, etc.	26.3		
Fat, bone		58.0	
Total	89.6	58.0	147.6
LOIN (110.5 lbs)			
Portherhouse steak	19.5		
T-bone steak	9.9		
Top loin steak	5.4		
Sirloin steak	43.2		
Ground beef	3.0		
Fat, bone		29.5	
Total	81.0	29.5	110.5
FLANK (37.1 lbs)			
Flank steak	3.7		
Ground beef	13.8		
Fat		19.6	
Total	17.5	19.6	37.1
RIB (62.0 lbs)			
Rib roast	25.4		
Rib steak	13.0		
Short ribs	4.9		
Braising beef, ground beef	6.5		
Fat, bone		12.2	
Total	49.8	12.2	62.0
PLATE (54.0 lbs)			
Plate, stew, short ribs	43.2		
Fat, bone		10.8	
Total	43.2	10.8	54.0
CHUCK (176.8 lbs)			
Blade roast	63.6		
Arm pot roast	23.9		
Cross rib pot roast	22.1		
Stew, ground beef	34.4		
Fat, bone		32.8	
Total	144.0	32.8	176.8
BRISKET (27.3 lbs)			
Boneless brisket	11.0		
Fat, bone		16.3	
Total	11.0	16.3	27.3
FORESHANK (18.9 lbs)			
Shank meat	9.0		
Bone		9.9	
Total	9.0	9.9	18.9
MISCELLANEOUS (15.8 lbs)			
Kidney, hanging tender	3.7		
Fat, suet, shrink and loss		12.1	
Total	3.7	12.1	15.8
TOTAL	**448.8**	**201.2**	**650.0**

Source: American Meat Institute Meatfacts, 1984; derived from USDA and industry figures.

Carcass Cutout, continued

You are the meat department manager in a retail grocery supermarket. Your department is a major income-producer for the store. You must maintain a 25 percent mark-up over cost to cover your operating costs, yet you need to meet competition prices. Hence, you are always changing prices and need to make frequent cut-out tests. Complete the cells in the table below to accomplish your mark-up policy on a 50-pound beef loin for which you paid $2.00 per pound.

Name of Cut	Weight of Cuts	Price per Pound	Sales Value
Sirloin Tip Roast	7 lbs.	$3.50	$24.50
Sirloin Steak	12 lbs.	3.20	38.40
T-Bone Steak	8 lbs.	4.30	34.40
Porterhouse Steak	5 lbs.	4.46	22.30
Hamburger Trim	3 lbs.	1.80	5.40
Waste (bone, tallow)	15 lbs.	0.00	0.00

Cost + 25% mark-up = sale value of: $ 125.00

7. **"The Buyer's Dilemma"**

Packer Buyers are instructed on price for all grades and classes of livestock. Usually, even in feedlot cattle, the buyer finds mixtures of finish, grade, sex, and dressing percentage. He needs to take all these into account, plus perhaps a pencil shrink estimate, in calculating a purchase offer. You might want to work your way through the following illustrations.

A. A packer buyer is instructed to 'hang Choice cattle for a dollar' and sets out for a feedlot where he finds fed steers for which he offers '$62 and 3 percent'. This means he thinks the steers will dress out at about what percent: (a) 62; (b) 59; (c) 65; (d) 60.1.

B. These are your cattle and you recognize that the price the buyer is offering (over your scales) is: (a) 63.92; (b) $63.86; (c) $60.19; (d) $60.14.

C. The buyer gets the cattle to the plant where it is discovered that their average dressing percentage was 61. At the price he paid, this is equivalent to hanging the cattle at what price per pound: (a) $1.016; (b) $0.986; (c) $0.987; (d) $1.048.

D. At a second feedlot the buyer finds a pen of mixed steers and heifers which he judges to contain 40 heifers at 60 percent and 60 steers at 61 percent, all Choice-3. He offers $60.60 for the lot and when they are killed he finds that the pen averaged 61 percent. From what you know, which of the following would be the price that more accurately reflects their live value: (a) $61; (b) $61.61; (c) $59.17; (d) $62.89.

5. **"Buyer's Dilemma"**, continued

E. This buyer arrives at your feedlot where he sizes up the cattle you had called him about and you agree that maybe 5 percent of the cattle are prime ($1.20) and that they will dress out at 62 percent. The buyer wants an overnight stand and 2 percent. You think an overnight stand or 2 percent might be OK, but not both, so you counter with a price that cancels the pencil shrink. What price is that: (a) $63.24; (b) 64.50; (c) $64.56; (d) $63.90.

F. You are a buyer for a 'new breed' packer in the High Plains and have been sent to look at some cattle in a feedlot near Hereford, Texas. On this day your boss has instructed you to deliver cattle to the rail at carcass prices of $1.20 per pound for Choice steers, $1.10 per pound for Choice heifers and Good steers; and $1.00 for Good heifers. The feedlot has one particular lot of 100 head it wants to move. You are told there are 50 steers and 50 heifers. In addition, it looks to you like 10 of the steers will only grade Good, and so will 10 of the heifers. You estimate dressing percentage to be 61 for the best steers, 60 percent for the Good steers and Choice heifers, and 59 percent for the Good heifers. You know it will cost 40¢ per cwt to haul them to the plant and, since you will be buying over the feedlot scales, you decide you'd better shrink the whole lot 4 percent over the feedlot scales. So you do your figuring, subtracting the freight before you pencil shrink. What price do you quote for the lot? (a) $65.07; (b) $68.41; (c) $70.60; (d) $71.02.

(1) 1.20 × 61 × 40 = 292.80
1.10 × 60 × 50 = 330.00
1.00 × 59 × 10 = 59.00
681.80
− 40
(2) 68.18 − .40 freight = $67.78

(3) If shrunk 4%, effective price for original weight is 67.78 × .96 = $65.07

(4) counterbid to protect $67.78 from this is 67.78 ÷ .96 = $70.60

8. Hedging

Remember that hedging requires you to have positions in the cash market and the futures market at the same time and that these must always be simultaneous, equal, and opposite. If the basis (futures price minus cash price) is the same at the end of the hedge as at the beginning, the two contracts will have offset each other exactly. A perfect hedge is not frequent, but the change in basis is small compared to the change in price so the hedge typically does provide protection agains price change even when the hedge is not perfect. The format below is always a useful accounting aid in figuring a hedge. Try this out. Assume it is May 15 and your corn planting is finished. The WSJ says cash corn is at $3.00 and December corn on that day is $3.25. On December 1 you sell the cash corn and lift your December contract at $3.00. Assume a perfect hedge. What was WSJ cash corn on December 1?

CASH	FUTURES
Date _____	Date _____
Date _____	Date _____
Net price change per unit ± _____	Net price change per unit ± _____